

CLAIMS

1. A data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size, the data replacement output apparatus comprising:

a determining unit operable to determine whether to perform a sequential output of a predetermined number of units of data constituting the replacement data, based on a result of comparison between (i) a total number of units of data constituting the replacement object data that have been received during a time period from a reference time to a current time and (ii) a total number of units of data constituting the replacement data that have been output during the time period, the determination being made each time a unit of data constituting the replacement object data is received while the sequential output of data is not performed; and

a data output unit operable to, if the determining unit determines to perform the sequential output of data, perform

the sequential output of data by outputting a unit of data constituting the replacement data each time a unit of data constituting the data stream is received, operable to output a unit of data constituting the non-replacement-object data each
5 time a unit of data constituting the non-replacement-object data is received while the sequential output of data is not performed, and operable to, if the determining unit determines not to perform the sequential output of data, output a unit of data constituting the non-replacement-object data each time a unit of data
10 constituting the data stream is received.

2. The data replacement output apparatus of Claim 1, wherein the determining unit includes:

a judging sub-unit operable to, each time a unit of data
15 is received, judge whether the received unit of data constitutes the replacement object data; and

a comparing sub-unit operable to compare the total number of units of data constituting the replacement object data that have been received during the time period with the total number
20 of units of data constituting the replacement data that have been output during the time period, wherein

the determining unit determines to perform the sequential output of data if it is found as a result of the comparison by

the comparing sub-unit that the total number of units of data constituting the replacement data that have been output during the time period is no larger than the total number of units of data constituting the replacement object data that have been
5 received during the time period.

3. The data replacement output apparatus of Claim 2, wherein the data output unit includes

a storage sub-unit operable to store the
10 non-replacement-object data, and

the data output unit reads a unit of data constituting the non-replacement-object data from the storage sub-unit and outputs the read unit of data each time a unit of data constituting the non-replacement-object data is received while the sequential
15 output of data is not performed, and if the determining unit determines not to perform the sequential output of data, reads a unit of data constituting the non-replacement-object data from the storage sub-unit and outputs the read unit of data each time a unit of data constituting the data stream is received.

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4. The data replacement output apparatus of Claim 1, wherein the determining unit includes:

a judging sub-unit operable to, each time a unit of data

is received, judge whether the received unit of data constitutes the replacement object data;

a calculating sub-unit operable to calculate a replacement excess count value by subtracting (i) the total number of units of data constituting the replacement data that have been output
5 during the time period from (ii) the total number of units of data constituting the replacement object data that have been received during the time period; and

a count value judging sub-unit operable to judge whether
10 the replacement excess count value is smaller than the predetermined number as in the predetermined number of units of data constituting the replacement data that are output sequentially, and

the determining unit determines to perform the sequential
15 output of data if the count value judging sub-unit judges that the replacement excess count value is no smaller than the predetermined number.

5. The data replacement output apparatus of Claim 1, wherein
20 the determining unit includes:

a judging sub-unit operable to, each time a unit of data is received, judge whether the received unit of data constitutes the replacement object data;

a calculating sub-unit operable to calculate a replacement excess count value by subtracting (i) the total number of units of data constituting the replacement data that have been output during the time period from (ii) the total number of units of data constituting the replacement object data that have been
5 received during the time period; and

a count value judging sub-unit operable to judge whether the replacement excess count value is no smaller than half of the predetermined number as in the predetermined number of units
10 of data constituting the replacement data that are output sequentially, and

the determining unit determines to perform the sequential output of data if the count value judging sub-unit judges that the replacement excess count value is no smaller than half of
15 the predetermined number.

6. The data replacement output apparatus of Claim 1, wherein

the data stream includes a plurality of types of replacement object data,

20 the data output unit includes

a replacement data storage sub-unit operable to store a plurality of types of replacement data that respectively correspond to the plurality of types of replacement object data,

and

the determining unit determines whether to perform the sequential output of a predetermined number of units of data constituting any of the plurality of types of replacement data, based on a result of comparison between each pair of (i) a total number of units of data constituting one of the plurality of types of replacement object data that have been received during the time period and (ii) a total number of units of data constituting one of the plurality of types of replacement data, which corresponds to the type of replacement object data in (i), that have been output during the time period.

7. The data replacement output apparatus of Claim 6, wherein the determining unit calculates the replacement excess count value for each pair of a type of replacement object data and a corresponding type of replacement data, and

if one or more replacement excess count values calculated by the determining unit are smaller than "0", the determining unit selects a type of replacement data among one or more types of replacement data corresponding to the one or more replacement excess count values that are smaller than "0", based on a predetermined criterion, and determines to perform the sequential output of a predetermined number of units of data

constituting the selected type of replacement data.

8. The data replacement output apparatus of Claim 7, wherein
the determining unit selects a type of replacement data
5 that corresponds to the smallest value among the one or more
replacement excess count values, and determines to perform the
sequential output of a predetermined number of units of data
constituting the selected type of replacement data.

10 9. The data replacement output apparatus of Claim 7, wherein
different priority levels are respectively assigned to
the plurality of types of replacement data, and

the determining unit selects a type of replacement data
to which the highest priority level has been assigned among one
15 or more types of replacement data that correspond to the one
or more replacement excess count values, and determines to
perform the sequential output of a predetermined number of units
of data constituting the selected type of replacement data.

20 10. The data replacement output apparatus of Claim 7, wherein
a type of replacement data is pre-selected from the
plurality of types of replacement data, and
if a replacement excess count value for the pre-selected

type of replacement data is smaller than "0", the determining unit selects the pre-selected type of replacement data, and

if the replacement excess count value for the pre-selected type of replacement data is no smaller than "0", the determining

5 unit selects a type of replacement data that corresponds to the smallest value among the one or more replacement excess count values, and

determines to perform the sequential output of a predetermined number of units of data constituting the selected

10 type of replacement data.

11. The data replacement output apparatus of Claim 6, wherein

different priority levels are respectively assigned to the plurality of types of replacement data and the

15 non-replacement-object data,

the determining unit calculates the replacement excess count value for each pair of a type of replacement object data and a corresponding type of replacement data, and

if one or more replacement excess count values calculated

20 by the determining unit are smaller than "0", and if any priority level assigned to a type of replacement data corresponding to a replacement excess count value smaller than "0" is no smaller than a priority level assigned to the non-replacement-object

data, the determining unit determines to perform the sequential output of a predetermined number of units of data constituting any type of replacement data corresponding to any of replacement excess count values smaller than "0".

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12. The data replacement output apparatus of Claim 1, wherein the data stream includes a plurality of types of replacement object data,

the data output unit includes

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a post-replacement data storage sub-unit operable to store a plurality of types of replacement data that respectively correspond to the plurality of types of replacement object data, and

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the determining unit determines whether to perform the sequential output of a predetermined number of units of data constituting any of the plurality of types of replacement data, based on a result of comparison between (i) a total number of units of data constituting the plurality of types of replacement object data that have been received during the time period and (ii) a total number of units of data constituting the plurality of types of replacement data that have been output during the time period.

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13. A data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream
5 containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size,

the data stream contains a sequence of M units of data
10 constituting the replacement object data,

the replacement data is composed of replacement-purpose data and dummy data,

the data replacement output apparatus comprising:

a replacement judging unit operable to judge whether a
15 received unit of data belongs to the sequence of M units of data constituting the replacement object data or the non-replacement-object data; and

a data output unit operable to, if the replacement judging unit judges that the received unit of data belongs to the sequence
20 of M units of data constituting the replacement object data, sequentially output N units of data constituting the replacement-purpose data and (M - N) units of data constituting the dummy data each time the sequence of M units of data is received,

where $M \geq N$, and N is an integer no smaller than "1", and operable to, if the replacement judging unit judges that the received unit of data belongs to the non-replacement-object data, output a unit of data constituting the non-replacement-object data each
5 time a unit of data constituting the non-replacement-object data is received.

14. A data replacement output apparatus for receiving a data stream composed of replacement object data and
10 non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is
15 composed of a plurality of units of data having the same size, the data stream contains a sequence of a plurality of units of data constituting the replacement object data,

the replacement data is composed of replacement-purpose data and dummy data,

20 the data replacement output apparatus comprising:

a replacement judging unit operable to judge whether a received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data or

the non-replacement-object data;

a detecting unit operable to detect a number of units of data contained in the sequence that constitutes the replacement object data if the replacement judging unit judges that the received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data;

a judging unit operable to judge whether the number of units of data detected by the detecting unit is smaller than N, where N is an integer no smaller than "1"; and

a data output unit operable to, if the judging unit judges that the number of units of data detected by the detecting unit is smaller than N, sequentially output as much units of data constituting the dummy data as the number of units of data detected by the detecting unit each time the sequence of the plurality of units of data is received, and

operable to, if the judging unit judges that the number of units of data detected by the detecting unit is larger than N, sequentially output (i) N units of data constituting the replacement-purpose data and (ii) each time the sequence of the plurality of units of data is received, as much units of data constituting the dummy data as a difference between N and the number of units of data detected by the detecting unit, and

operable to, if the replacement judging unit judges that

the received unit of data belongs to the non-replacement-object data, output a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received.

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15. A data replacement output method for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data,
10 and outputting the data stream containing the replacement data, wherein each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size, the data replacement output method comprising:

15 a determining step for determining whether to perform a sequential output of a predetermined number of units of data constituting the replacement data, based on a result of comparison between (i) a total number of units of data constituting the replacement object data that have been received
20 during a time period from a reference time to a current time and (ii) a total number of units of data constituting the replacement data that have been output during the time period, the determination being made each time a unit of data constituting

the replacement object data is received while the sequential output of data is not performed; and

a data output step for, if the determining step determines to perform the sequential output of data, performing the sequential output of data by outputting a unit of data constituting the replacement data each time a unit of data constituting the data stream is received, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received while the sequential output of data is not performed, and if the determining step determines not to perform the sequential output of data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the data stream is received.

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16. A data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size,

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the data replacement output control program comprising:

a determining step for determining whether to perform a sequential output of a predetermined number of units of data constituting the replacement data, based on a result of comparison between (i) a total number of units of data constituting the replacement object data that have been received during a time period from a reference time to a current time and (ii) a total number of units of data constituting the replacement data that have been output during the time period, the determination being made each time a unit of data constituting the replacement object data is received while the sequential output of data is not performed; and

a data output step for, if the determining step determines to perform the sequential output of data, performing the sequential output of data by outputting a unit of data constituting the replacement data each time a unit of data constituting the data stream is received, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received while the sequential output of data is not performed, and if the determining step determines not to perform the sequential output of data, outputting a unit of data constituting the non-replacement-object data each time a unit of data

constituting the data stream is received.

17. A computer-readable recording medium recording therein a data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size, the data replacement output control program comprising:

a determining step for determining whether to perform a sequential output of a predetermined number of units of data constituting the replacement data, based on a result of comparison between (i) a total number of units of data constituting the replacement object data that have been received during a time period from a reference time to a current time and (ii) a total number of units of data constituting the replacement data that have been output during the time period, the determination being made each time a unit of data constituting the replacement object data is received while the sequential output of data is not performed; and

a data output step for, if the determining step determines to perform the sequential output of data, performing the sequential output of data by outputting a unit of data constituting the replacement data each time a unit of data constituting the data stream is received, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received while the sequential output of data is not performed, and if the determining step determines not to perform the sequential output of data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the data stream is received.

18. A data replacement output method for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size, the data stream contains a sequence of M units of data

constituting the replacement object data,

the replacement data is composed of replacement-purpose data and dummy data,

the data replacement output method comprising:

5 a replacement judging step for judging whether a received unit of data belongs to the sequence of M units of data constituting the replacement object data or the non-replacement-object data; and

10 a data output step for, if the replacement judging step judges that the received unit of data belongs to the sequence of M units of data constituting the replacement object data, sequentially outputting N units of data constituting the replacement-purpose data and (M - N) units of data constituting the dummy data each time the sequence of M units of data is received,

15 where $M \geq N$, and N is an integer no smaller than "1", and if the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data

20 is received.

19. A data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed

of replacement object data and non-replacement-object data,
replacing the replacement object data with replacement data,
and outputting the data stream containing the replacement data,
wherein

5 each of the replacement object data, the
non-replacement-object data, and the replacement data is
composed of a plurality of units of data having the same size,

the data stream contains a sequence of M units of data
constituting the replacement object data,

10 the replacement data is composed of replacement-purpose
data and dummy data,

the data replacement output control program comprising:

a replacement judging step for judging whether a received
unit of data belongs to the sequence of M units of data constituting

15 the replacement object data or the non-replacement-object data;
and

a data output step for, if the replacement judging step
judges that the received unit of data belongs to the sequence
of M units of data constituting the replacement object data,
20 sequentially outputting N units of data constituting the
replacement-purpose data and (M - N) units of data constituting
the dummy data each time the sequence of M units of data is received,
where $M \geq N$, and N is an integer no smaller than "1", and if

the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data
5 is received.

20. A computer-readable recording medium recording therein a data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed
10 of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the
15 non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size,

the data stream contains a sequence of M units of data constituting the replacement object data,

the replacement data is composed of replacement-purpose
20 data and dummy data,

the data replacement output control program comprising:

a replacement judging step for judging whether a received unit of data belongs to the sequence of M units of data constituting

the replacement object data or the non-replacement-object data;
and

a data output step for, if the replacement judging step judges that the received unit of data belongs to the sequence
5 of M units of data constituting the replacement object data, sequentially outputting N units of data constituting the replacement-purpose data and (M - N) units of data constituting the dummy data each time the sequence of M units of data is received, where $M \geq N$, and N is an integer no smaller than "1", and if
10 the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received.

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21. A data replacement output method for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data,
20 and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is

composed of a plurality of units of data having the same size,

the data stream contains a sequence of a plurality of units of data constituting the replacement object data,

the replacement data is composed of replacement-purpose

5 data and dummy data,

the data replacement output method comprising:

a replacement judging step for judging whether a received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data or the

10 non-replacement-object data;

a detecting step for detecting a number of units of data contained in the sequence that constitutes the replacement object data if the replacement judging step judges that the received unit of data belongs to the sequence of the plurality of units

15 of data constituting the replacement object data;

a judging step for judging whether the number of units of data detected in the detecting step is smaller than N, where N is an integer no smaller than "1"; and

a data output step for, if the judging step judges that
20 the number of units of data detected in the detecting step is smaller than N, sequentially outputting as much units of data constituting the dummy data as the number of units of data detected in the detecting step each time the sequence of the plurality

of units of data is received, and

if the judging step judges that the number of units of data detected in the detecting step is larger than N, sequentially outputting (i) N units of data constituting the replacement-purpose data and (ii) each time the sequence of the plurality of units of data is received, as much units of data constituting the dummy data as a difference between N and the number of units of data detected in the detecting step, and

if the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received.

22. A data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size,

the data stream contains a sequence of a plurality of units of data constituting the replacement object data,

the replacement data is composed of replacement-purpose data and dummy data,

5 the data replacement output control program comprising:

a replacement judging step for judging whether a received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data or the non-replacement-object data;

10 a detecting step for detecting a number of units of data contained in the sequence that constitutes the replacement object data if the replacement judging step judges that the received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data;

15 a judging step for judging whether the number of units of data detected in the detecting step is smaller than N , where N is an integer no smaller than "1"; and

a data output step for, if the judging unit judges that the number of units of data detected in the detecting step is smaller than N , sequentially outputting as much units of data constituting the dummy data as the number of units of data detected in the detecting step each time the sequence of the plurality of units of data is received, and

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if the judging step judges that the number of units of data detected in the detecting step is larger than N, sequentially outputting (i) N units of data constituting the replacement-purpose data and (ii) each time the sequence of the plurality of units of data is received, as much units of data constituting the dummy data as a difference between N and the number of units of data detected in the detecting step, and

if the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received.

23. A computer-readable recording medium recording therein a data replacement output control program for use in a data replacement output apparatus for receiving a data stream composed of replacement object data and non-replacement-object data, replacing the replacement object data with replacement data, and outputting the data stream containing the replacement data, wherein

each of the replacement object data, the non-replacement-object data, and the replacement data is composed of a plurality of units of data having the same size,

the data stream contains a sequence of a plurality of units of data constituting the replacement object data,

the replacement data is composed of replacement-purpose data and dummy data,

5 the data replacement output control program comprising:

a replacement judging step for judging whether a received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data or the non-replacement-object data;

10 a detecting step for detecting a number of units of data contained in the sequence that constitutes the replacement object data if the replacement judging step judges that the received unit of data belongs to the sequence of the plurality of units of data constituting the replacement object data;

15 a judging step for judging whether the number of units of data detected in the detecting step is smaller than N, where N is an integer no smaller than "1"; and

a data output step for, if the judging unit judges that the number of units of data detected in the detecting step is smaller than N, sequentially outputting as much units of data
20 constituting the dummy data as the number of units of data detected in the detecting step each time the sequence of the plurality of units of data is received, and

if the judging step judges that the number of units of data detected in the detecting step is larger than N, sequentially outputting (i) N units of data constituting the replacement-purpose data and (ii) each time the sequence of the plurality of units of data is received, as much units of data constituting the dummy data as a difference between N and the number of units of data detected in the detecting step, and

if the replacement judging step judges that the received unit of data belongs to the non-replacement-object data, outputting a unit of data constituting the non-replacement-object data each time a unit of data constituting the non-replacement-object data is received.